Statement Of

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POET

House Subcommittee on Energy & Air Quality

"POET's commitment to cellulosic ethanol"

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Preamble:

Mr. Chairman and distinguished committee members, thank you for the opportunity to visit with you today. My name is Dr. Mark Stowers. I am Vice President, Research and Development for POET. I would like to talk with you today about our company's commitment to cellulosic ethanol as well as the challenges and opportunities presented by that endeavor.

POET – INTRODUCTION

POET, headquartered in Sioux Falls, South Dakota, is the largest dry mill ethanol producer in the United States. POET is an established leader in the biorefining industry through project development, design and construction, research and development, plant management, ownership, and product marketing. The 20-year old company has built twenty-nine (29) ethanol production facilities and currently manages twenty-three (23) plants in the United States while marketing more than 1.3 billion gallons of ethanol and 3.5 million tons of distillers grains annually.

Since 2000, POET has constructed twenty-one (21) green field ethanol plants in seven (7) states and completed six (6) major expansions of existing facilities. The value of our design build contracts since 2000 has exceeded $1,000,000,000. Additionally, three (3) green field projects of similar size and scope are currently under construction with several others in development. Each project has been successfully designed, built and

managed by POET. These projects have resulted in the addition of more than one billion gallons per year (MGPY) of new fuel ethanol capacity.

The POET development model is unique. It started on the Broin family farm in Minnesota and has been spurred by the investment of thousands of farmers and individual main street investors. POET's business model is to invest in, develop, design, construct and manage ethanol production facilities. However, the facilities are independent limited liability companies (LLC) owned primarily by individuals and local farmers that provide the corn feedstock. POET employs the facility's general manager and on-site technical engineer. All other employees are employed by the LLC. POET also has Board of Director representation at each plant.

By leveraging business size and position, POET has created the most successful ethanol facilities in the industry. POET has achieved breakthrough progress beyond ethanol processing, extracting extraordinary new value from each kernel of corn and is focused on meeting the nation's needs for domestic transportation fuels through cellulosic ethanol.

IMPORTANCE OF CELLULOSIC ETHANOL

According to the recent US Department of Commerce International Trade Administration Study, "Energy in 2020: Assessing the Economic Effects of Commercialization of Cellulosic Ethanol" there is enough cellulosic feedstock available in the United States to

produce nearly 50 billion gallons of cellulosic ethanol by 2020. At this production rate over 1.2 million barrels per day of crude oil could be displaced while creating over 54,000 jobs in US agriculture. In more practical terms at this level of ethanol production the US could eliminate all oil purchases from OPEC and the Middle East – eliminating the $1.4 billion per day export of US dollars based on $120 per barrel oil to overseas producers.

In addition to the economic benefits, there are significant environmental benefits to cellulosic ethanol. Gasoline produces 25 pounds of carbon dioxide equivalent greenhouse gas (GHG) emissions. By comparison cellulosic ethanol reduces GHG emissions by a little more than 21 pounds of carbon dioxide on per gallon of gasoline equivalent – an 85% reduction. In order to monetize that benefit we can assign a value of $20 per ton of carbon dioxide equivalent based on current European futures prices for carbon dioxide equivalents. On that basis the GHG emission reductions resulting from the use of cellulosic ethanol would be worth about $0.19 per gallon or about $2.5 billion per year by using a little more than 20 billion gallons of cellulosic ethanol.

The value of cellulosic ethanol to the US economy, the environmental benefits and ability to mitigate national security risks are substantial. At POET we believe that cellulosic ethanol is real and achievable and something worth pursuing.

COMMITMENT TO CELLULOSIC ETHANOL

POET's commitment to cellulosic ethanol started eight years ago when our company developed proprietary fractionation and raw hydrolysis technologies for corn grain. These technologies allow POET to process corn starch more efficiently and economically. Corn fractionation technology or BFRAC™ is a POET proprietary process that separates the corn starch from the corn germ and corn fiber, the cellulosic casing that protects the corn kernel.

The corn germ can be processed to produce crude or refined corn oil which has multiple end uses ranging from cooking to biodiesel. The corn fiber, due to its high sugar content can be processed to ethanol.

The corn starch is processed without cooking using another proprietary process called BPX™ resulting in an 8-12% reduction in BTU consumption, greater conversion of corn starch to ethanol and a high nutrient density animal feed product which we label Dakota Gold®. This technology is important in that it allows us to use less fossil fuel, get better yields of ethanol per acre of corn and provide an animal feed product that the animal agricultural sector can use to replace corn in livestock, dairy, swine and poultry rations.

As you can see, corn ethanol plants are highly efficient, they produce more than just ethanol and they serve as sources for cellulosic feedstocks. Integrating cellulosic ethanol plants with corn ethanol plants has some significant advantages which will be addressed later.

The next step toward cellulosic ethanol production was to incorporate BFRAC™ and BPX into an existing biorefinery. In 2002, POET partnered with the U.S. Department of Energy to construct a "Second Generation Dry Mill Biorefinery." This effort sought to incorporate corn fractionation into a dry mill ethanol plant, processing the cellulosic corn fiber into ethanol and producing higher protein animal feed products. POET was able to incorporate a corn fractionation system in to a dry mill ethanol plant and to produce a higher protein animal feed product, but the ability to process corn fiber to ethanol proved to be more difficult due to limitations in the ability breakdown the corn fiber into usable sugars and for the sugars to be fermented to ethanol by known microorganisms.

In 2006 a new strategy for cellulosic ethanol production was developed at POET involving the utilization of existing corn ethanol plants to:

- Capitalize on existing infrastructure (utilities, roads, rail lines, materials handling and so forth)
- Focus on corn cobs as the primary cellulosic feedstock using the corn ethanol plant's existing farmer and often investor network to collect cobs
- Eliminate the use of fossil fuels by processing waste streams from the cellulosic ethanol process to provide energy for the entire plant, the corn to ethanol and cellulose to ethanol portions.

This approach would enable rapid deployment of the cellulosic ethanol process as across an expansive corn ethanol base through a "bolt-on" approach. POET is implementing this strategy through what it called Project LIBERTY, an integrated corn cellulose biorefinery.

Project LIBERTY will transform POET Biorefining – Emmetsburg, an existing corn dry mill ethanol plant located in Northwest Iowa, into an integrated corn-to-ethanol and cellulose-to-ethanol biorefinery. Once complete the facility will produce 125 million gallons of ethanol per year (mgpy), 25 of which will come from a feedstock of corn fiber and corn cobs. Also, the facility will annually produce 80,000 tons of Dakota Gold Corn Germ Dehydrated and 100,000 tons of Dakota Gold HP animal feed. The impact of Project LIBERTY in terms of ethanol production will be 11% more ethanol from a bushel of corn through the corn fractionation process and 27% more ethanol from an acre of corn through the use of corn cobs. In addition Project LIBERTY will require almost no energy from fossil fuels. The total cost of the project will be in excess of $200 million and create at least 30 new jobs at the facility.

The primary project goal is to design, construct, and operate the commercial-scale, integrated cellulosic ethanol biorefinery. Technologies will be replicable. POET's longer-term plans are to rollout the technologies to other existing dry mills or new biorefineries. POET is partnered with the Department of Energy in Project LIBERTY whereby DOE will contribute up to 40% or $80 million in project costs. Project LIBERTY is expected to be operational in late 2011.

There are three aspects of cellulosic ethanol production that are integral to Project LIBERTY – cellulosic feedstocks, cellulosic ethanol process technology and the importance of alternative energy generation at a cellulosic ethanol plant.

POET has established a leadership position in the collection of cellulosic feedstocks. These feedstocks can be agricultural residues such as corn cobs, rice straw or corn stover. They can also be wood fibers such as forestry wastes or wood wastes or energy crops such as switchgrass or *Miscanthus*. Municipal waste can also be a cellulosic feedstock.

POET has selected corn cobs as the first feedstock for the production of cellulosic ethanol because they offer significant technical, environmental and economic advantages. Cobs are typically left in the field after the corn harvest and, with low fertilizer value, can be removed from with little environmental impact. Corn cobs are also rich in sugars and are heavier that the corn stalk allowing them to be easily separated. And lastly they can be collected relatively easily by the same farmers that provide the ethanol plant the corn grain. Although the cob is small, we have projected that over 5 billion gallons of cellulosic ethanol could be produced from US corn cobs.

In 2007 POET collaborated with John Deere, Case IH and a number of major farm equipment manufacturers to collect corn cobs from 4,000 acres in Southeastern South Dakota. It was a very exciting time. For example one of our collaborators created over 6 different generations of equipment design while in the field – there was a great deal of excitement indeed. Corn farmers began to see the possibility of harvesting corn cobs and the potential to generate new farm income through the sale of corn cobs to the ethanol plant. Today, in our labs, we are analyzing the cobs that we collected. We are sampling the over 60 cob piles located at the farm to determine the cob quality: the rate of decomposition and the performance of stored cobs in the production ethanol. We have

developed our 2008 cob research plan and expect to collect cobs in South Dakota and Iowa to increase our understanding of the cob production process, educate growers and continue our collaboration with farm machinery companies to ensure that the best technology is available.

In order to develop and validate the necessary process technology for Project LIBERTY, POET restructured its research effort in cellulosic ethanol and expanded its collaborations across major corporations, universities and research institutes. We expanded our internal research and development effort, are nearing the completion of a 6 fold increase in laboratory space in Sioux Falls, South Dakota and will soon begin construction of a cellulosic ethanol pilot plant capable of processing multiple corn based cellulosic feedstocks such as corn fiber, corn cobs and corn stover. So what has changed about the processing of cellulose to ethanol since 2002 to increase our confidence that cellulosic ethanol is achievable?

Through our collaborations, especially with enzyme companies, we have been able to continually improve the process. Recently we devised a process to breakdown corn cobs into simple sugars resulting in a 60% increase in the yield of ethanol from cobs compared to just three months ago. By using physical and chemical treatments, we have been able to make corn cobs more digestible by enzymes without creating toxic by-products. We are now able to produce significant amounts of sugars for fermentation to ethanol.

We have also made significant progress in producing ethanol from simple sugars through better microorganisms and a better fermentation process. And lastly through our own cutting-edge process engineering expertise we have devised a synergistic concept for the integration of a corn ethanol plant with one using only cellulosic feedstock.

While these are very important breakthroughs we expect to be able to further optimize this process over the next few months to achieve the necessary economics to make the process profitable. Over time, we will continually improve the process, similar to what we are currently doing with the corn ethanol process.

Alternative energy plays an important role in the cellulosic ethanol process. The low value of cellulosic ethanol waste streams as animal feed products makes their most favorable use a feedstock for solid waste fuel boilers or anaerobic digestion.

POET is currently installing a solid waste fuel boiler at POET Biorefining – Chancellor. This boiler at our Chancellor, South Dakota plant will process up to 350 tons of dried wood chips from a waste pallet processor to produce steam for the plant. POET Biorefining – Chancellor has also reached agreement with the City of Sioux Falls to purchase landfill gas for the boiler. By using wood waste and landfill gas, the Chancellor plant can eliminate 100 percent of its need for fossil fuels.

POET's Project LIBERTY will also incorporate a solid waste fuel boiler in its design. The feedstock for the LIBERTY boiler will be solid wastes from the cellulosic ethanol

operation and additional corn cobs collected as part of the cellulosic feedstock. When coupled to an anaerobic digestion system to process the liquid wastes from the cellulosic process nearly all of the energy needs for the cellulosic- and starch-based operations can be met.

There are many other companies that are also making significant investments in cellulosic ethanol. If the development and commercialization of cellulosic ethanol is to continue, there are several things that need to happen:

1. A strong corn to ethanol business and infrastructure is crucial to the development of cellulosic ethanol. Without it, cellulosic ethanol will be delayed. The corn to ethanol industry can provide existing grower networks, production knowledge, product, market and logistics knowledge to emerging cellulose producers and a distribution infrastructure. Financial lenders will support cellulosic ethanol provided there is a strong corn to ethanol industry.
2. The importance of the Renewable Fuel Standard (RFS). The RFS provides an important target for cellulosic ethanol – a real and attainable target. Continued support of the RFS will be important in demonstrating to the ethanol, transportation fuel and financial industries that there will be a market for ethanol.
3. Increased Usage of Ethanol and Greater Numbers of Flexible Fuel Vehicles. Recent research supports the inclusion of greater concentrations of ethanol as a gasoline replacement – expanding the use of ethanol beyond its historical role as a fuel oxygenate. So called "Mid Level Blends" of E20 and E30 have shown to be

equal and in some cases better in overall miles per gallon with little to no deleterious impact on vehicles that make up the current US automotive fleet. The increased commercialization of flexible fuel vehicles could help drive the greater usage of these mid level blends further reducing our dependence on foreign oil, reducing our fuel costs and helping the environment.

4. Governmental support. Governmental programs are necessary, especially during the early stages of the cellulosic ethanol industry development to enable financing at the grower/farmer level as well as cellulosic ethanol producers in terms of incentives, loan guarantees and market assurances. The energy title of the House passed farm bill provides the support through loan guarantees and a pilot program for the harvesting, transporting, and storing of cellulosic material that will move cellulosic ethanol much quicker to commercialization.
5. Continued investment in research and development. Significant cost reductions in the cellulosic ethanol process are required. The cost of enzymes still remains one of the most significant variable costs associated with the process. Microorganisms are only 20% as efficient in converting biomass derived simple sugars into ethanol as their counterparts that convert starch to ethanol.

Thank you for the opportunity to submit recommendations. Poet looks forward to working in partnership with the Congress, DOE and USDA to advance cellulosic ethanol to the marketplace in order to meet our renewable energy goals.